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EXAMINER	
DYE, ROBERT C	

ART UNIT	PAPER NUMBER
1791	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/589,589	SEKIDO ET AL.	
	Examiner	Art Unit	
	ROBERT DYE	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 August 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-85* is/are pending in the application.

4a) Of the above claim(s) *24-49 and 70-85* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23 and 50-69* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/05/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

The species are as follows:

Group 1, comprising embodiment 1 (figure 1) wherein an intermediate member having resin paths is provided between the mold die

Group 2, comprising embodiment 2 (figure 8) wherein multiple resin injection ports are provided around the circumference of the mold die

Group 3, comprising embodiment 3 (figure 18) wherein a fibrous layer is disposed below the fiber preform

Applicant is required, in reply to this action, to elect a single species to which the claims shall be restricted if no generic claim is finally held to be allowable. The reply must also identify the claims readable on the elected species, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered non-responsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

2. The claims are deemed to correspond to the species listed above in the following manner:

Group 1: Claims 3-23, 52-69

Group 2: Claims 24-42, 70-85

Group 3: Claims 43-49

The following claim(s) are generic: 1, 2, 50, and 51.

3. The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons: There is no special technical feature that links the groups. While claims 3, 24, and 43 share independent claim 1 and 52 and 70 share independent claim 50, these independent claims do not contain a special technical feature in view of the prior art. Freeman (USP 4,724,115, of record) discloses a method and apparatus for resin transfer molding wherein a fiber substrate is placed within a cavity of a mold, the mold is closed and resin is injected into divided areas via resin paths to complete the molding. A more detailed explanation of the lack of special technical features is given below.

4. During a telephone conversation with Dan Christenbury on 2/6/2009 a provisional election was made without traverse to prosecute the invention of Group 1, claims 3-23 and 52-69. Affirmation of this election must be made by applicant in replying to this Office action. Claims 24-49 and 70-85 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

6. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1 and 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Freeman (USP 4,724,115, of record).

9. Freeman teaches a method and apparatus for injecting resin into a fibrous preform. Freeman teaches a mold including upper and lower mold pieces which receive reinforcement or fabric (col 2, lines 13-15). Freeman does not explicitly state a clamping step; however, a step of securely closing the two mold halves with the preform disposed inside prior to injection of resin would be inherent to the molding process. Freeman further teaches that a source of resin is connected to a plurality of inlet ports to impregnate the fiber or reinforcement material (col 2, lines 36-39).

10. Claims 1, 3, 10, 11, 50, 52, 59, 60 and 62 are rejected under 35 U.S.C. 102(b) as being anticipated by Hettinga (USP 4,743,323).

11. Regarding claims 1 and 50, Hettinga teaches a method and apparatus wherein a fibrous substrate is disposed into a mold cavity, the mold cavity is clamped with clamping means 21, and resin is injected into a fibrous substrate via multiple pathways (see channels in block 18).

12. Regarding claims 3 and 52, Hettinga illustrates that in figures 4 and 5 that mold 18 is divided into two parts with an intermediate member containing plural resin paths extending through the thickness direction to permit injection of resin into the fiber substrate from a plurality of positions almost simultaneously.

13. Regarding claims 10 and 59, Hettinga illustrates the use of an intermediate member with two through holes to allow resin passage between the mold die and the fibrous preform. The intermediate member can be construed as a plate and further, the presence of multiple holes means it is perforated. Thus the intermediate member of Hettinga can be construed as a perforated plate.

14. Regarding claims 11 and 60, figure 4 further illustrates that the die contacting the intermediate member contains a groove which forms a resin path between the injection port and the through holes.

15. Regarding claims 16 and 65, wherein gas and excessive resin are discharged intermittently, such would be intrinsic to the mold of Hettinga. As resin infiltrates the preform and gas and excess resin are removed from the cavity, gas bubbles will inherently be released along with excess resin via the outlet. It would be expected that bubbles mixed with resin would be released during the resin infiltration step and thus result in intermittent release of gas and resin.

16. Regarding claims 17 and 66, wherein the flow rate of resin flowing into the mold is controlled by the pressure differential between the injection pressure of the resin and the pressure within the mold; such would be inherent to any resin transfer process. The flow of resin from one cavity (injection port) to a second cavity (mold) would inherently depend on a pressure drop driving the fluid flow. There would inherently be no net resin flow if the pressures are equal (Pm=Pi) and there would be positive flow if the injection pressure is higher than the mold pressure (Pi>Pm).

17. Regarding claim 62, wherein a core material is laminated to said reinforcing substrate, the apparatus of Hettinga is capable of working upon a laminated substrate. Examiner wishes to point out to applicant that claims 51-69 are directed towards an apparatus and as such will be examined under such conditions. The material worked upon or the process of using the apparatus are viewed as recitation of intended use and are given no patentable weight (Please see MPEP 2114 R1-2115 R2 for further details).

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

19. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

20. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

21. Claims 2, 9, 51 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) as applied to claims 1 and 50 above, and further in view of Cushman (USP 5,248,467).

22. Regarding claims 2 and 51, Hettinga does not expressly teach the use of vacuum suction. In the same field of endeavor of resin transfer molding, Cushman teaches a method and apparatus wherein a vacuum suction is applied to the mold cavity for the purpose of removing gasses, adsorbed and chemisorbed water and other substances

prior to resin injection (abstract and col 2, lines 14-30) and further use of the vacuum during injection to speed the injection process by reducing internal mold pressure (col 2, lines 7-10). Thus, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a vacuum suction on the mold cavity prior to and during resin injection as taught by Cushman in the method and apparatus of Hettinga for the purpose of evacuating the mold cavity of gasses and speeding up the injection process (abstract).

23. Regarding claims 9 and 58, Hettinga does not disclose a discharge member. In the same field of endeavor of resin transfer molding, Cushman discloses resin discharge members (items 21 and 22, figure 4) which collect resin overflow as it exits the mold cavity. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate a discharge member as taught by Cushman for collecting the resin overflow (col 9, lines 25-30). Regarding the placement of the discharge member, the location of the resin discharge member between the intermediate member and the mold die is an obvious matter of mere engineering design choice for a person having ordinary skill in the art at the time of the injection. Placement of the discharge member at such a location would provide benefits for alleviating machining costs of the mold tool or size constraints on the molding device. It would further be obvious to a person having ordinary skill in the art to seal said member in place such that resin leaks would be prevented.

24. Claims 4, 5, 53, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) as applied to claim 3 above, and further in view of Seemann (USP 5,439,635).

25. Hettinga teaches the method and apparatus for injecting resin into a fibrous substrate but does not teach that a discharge groove extends over the circumference of the fiber substrate and is formed on the die or the intermediate member. In the same field of endeavor of resin transfer molding, Seemann teaches the use of resin grooves formed in the molding die and which are disposed about the circumference of the fiber substrate to facilitate the removal of resin (vacuum flow conduit 24) to uniformly draw resin from the supply conduit through the fibrous preform (col 9, lines 3-12). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a discharge groove that extended around the circumference of the preform as taught by Seemann in the mold of Hettinga for the purpose of uniformly drawing the resin through the preform. Regarding placement of the groove in the intermediate member, such is a mere engineering design choice and it would have been obvious to a person having ordinary skill in the art to locate the resin discharge groove on a surface of the intermediate member. With fiber substrate located between the intermediate member and a mold, a person having ordinary skill in the art would recognize that since the both surfaces are in immediate contact with the preform, either surface would be suitable for placement of a groove to draw away excess resin.

26. Claims 6, 7, 8, 12, 55, 56, 57, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323).

27. Regarding claims 6 and 55, Hettinga teaches the presence of a groove formed in between the mold die and intermediate member which acts as a resin distribution channel connecting the resin injection port with the through-channels formed in the intermediate member. While figures 4 and 5 illustrate the intermediate member forming a wall of said groove, Hettinga does not illustrate said groove formed in the intermediate member. However, a person having ordinary skill in the art at the time of the invention would have recognized that said groove could just has easily been formed on the surface of the intermediate member instead of the opposing mold face. It is a mere matter of engineering design choice that the resin distribution groove is formed on the mold face instead of the intermediate member face. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the groove on the intermediate member surface for the purpose of ensuring resin distribution from the resin inlet to the resin through paths.

28. Regarding claims 7 and 56, it is well known in the molding art to construct a mold out of metal material. It would have obvious to a person having ordinary skill in the art at the time the invention was made to construct the intermediate member from metal since is have been held to be within the ordinary skill of worker in the art to selected a known material on the basis of its suitability for the intended use. One would have been motivated to use metal for the purpose of constructing the mold from a material with high strength and durability.

29. Regarding claims 8 and 57, Hettinga does not teach that the injection member is nipped and sealed between the intermediate member and a die facing said intermediate member. However, the location of the resin injection port between the intermediate member and the mold die is an obvious matter of mere engineering design choice for a person having ordinary skill in the art at the time of the injection. Placement of the injection member at such a location would provide benefits for alleviating machining costs of the mold tool or size constraints on the molding device. It would further be obvious to a person having ordinary skill in the art to seal said member in place such that resin leaks would be prevented.

30. Regarding claims 12 and 61, figure 4 illustrates that a gap is formed between the mold die and the intermediate member (said gap is not limited to the entire surface or specific portions of said surface). Hettinga does explicitly teach the size of said gap; however, given the size of mold cavity and the preform being molded (a seat base), it gap would likely be on the order of a few millimeters. Further, it would have been obvious to a person having ordinary skill in the art at the time of the invention to adjust the gap size to within 1 to 10mm, since such a modification would involve only a mere change in the size of a component. A person having ordinary skill in the art would be motivated to choosing an appropriate scale of the gap in order to control the desired throughput and pressure drop of resin being supplied via said gap.

31. Claim 14 and 63 rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) as applied to claim 3 above, and further in view of Waldrop, III et al. (PGPub 2002/0022422).

32. Regarding claims 14 and 63, as discussed above for claims 8 and 57, it would have been an obvious matter of engineering design choice to choose the location of the resin injection member. Hettinga does not expressly disclose sealing a resin injection tube with an elastic material however. In the same field of endeavor, Waldrop, III et al. (hereinafter Waldrop) disclose a resin transfer device wherein Waldrop teaches that a simplified plumbing system to supply resin and vacuum reduces vacuum leaks and a preferable approach for porting is to deliver resin to the preform with tubes that pass through the rubber seals which seal the vacuum pressure within the mold (paragraph 120). Thus, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use resin delivery tubes which pass through rubber seals of the vacuum mold as taught by Waldrop in the mold of Hettinga for the purpose of preventing vacuum leaks.

33. Claim 15 and 64 rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) in view of Waldrop, III et al. (PGPub 2002/0022422) as applied to claim 14 and 63 above, and further in view of Cundiff et al. (USP 6,560,843).

34. Regarding claims 15 and 64, the combination of Hettinga and Waldrop does not teach an O-ring for sealing the cavity at the parting surfaces. In the same field of endeavor of resin transfer molding, Cundiff et al. (hereinafter Cundiff) teach that one or

more peripheral channels (20) are provided in the mold die to form seats for seal rings so as to allow an evacuated or pressurized environment around the mold cavity impressions (col 2, lines 57-61). Thus, it would have been obvious to a person having ordinary skill to use an O-ring to seal the mold cavities as taught by Cundiff in the combination of Hettinga and Waldrop for the purpose of ensuring a pressurized environment within the mold cavity. Regarding the O-ring being incorporated into the elastic material for the seal, Waldrop does teach that tubes a preferably passed through the rubber seals of the cavity; thus the tubes would preferably pass through the O-ring seal of Cundiff.

35. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) as applied to claim 3 above, and further in view of Foster (USP 5,565,162).

36. Regarding claim 13, Hettinga does not teach a method wherein a core material is laminated to the fiber substrate. However, it is well known in the art that resin transfer molding can be used to laminate a fiber substrate to a core material. In the same field of endeavor of resin transfer molding, Foster teaches that multiple layers can be placed within the mold cavity. The introduction of resin into said layers and its subsequent curing would laminate said layers to each other.

37. Claims 18, 19, 67, 68 and 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) as applied to claims 16 and 65 above, and further in view of Cushman (USP 5,248,467).

38. Regarding claims 18, 19, 67, 68 and 69, Hettinga does not expressly teach a method or apparatus wherein the resin flow is controlled by controlling the diameter of a discharge port for discharging resin, in particular a valve. In the same field of endeavor of resin transfer molding, Cushman teaches that a valve (16) is opened and closed to control the discharge of resin from the resin injector into the mold cavity (see figure 4). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to use a valve to open/close the resin line as taught by Cushman in the method of Hettinga for the purpose of controlling the resin flow rate with the conventional and well known means to control fluid flow.

39. Regarding claims 19 and 68, the hypothetical combination of Hettinga and Cushman disclose a resin transfer molding apparatus and method with a means to control the discharge of resin into mold cavity. The combination does not teach that the timing is stored in memory and that the process is automated. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to automate valve opening and closing, since it have been held that broadly providing a mechanical or automatic means to replace a manual activity which accomplishes the same result involves only routine skill in the art. One would have been motivated to automate the valve control of the resin flow rate in order to increase consistency in the filling process and reduce error in the control system. Regarding the timing of the

adjustment being stored in memory, such would intrinsically be required for a control system to automatically function.

40. Claims 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) as applied to claim 3 above, and further in view of Freitas et al. (USP 5,921,754).

41. Regarding claims 20 and 21, Hettinga does not teach the resin flow rate, the projected area or the pressurizing force. In the same field of endeavor of resin transfer molding of composite material, Freitas et al. (hereinafter Freitas) teaches a method for molding turbine rotors wherein resin is injected at 20ml/min-60ml/min and at a pressure of about 30psi (about 0.2MPa). Freitas does not provide the projected area; however, a 20ml/min-60ml/min flow rate would correlate with a projected area range of 0.033m^2 to 1.2m^2 (for claim 20) or 0.01 to 0.6m (for claim 21 using 30psi). One would expect a conventional rotor blade to fall within those areas. It would have been obvious to use the mold conditions of Freitas in the method of Hettinga for the purpose of molding a diverse set of articles objects such as those of similar in size and construction to the rotor blades of Freitas.

42. Further, it would have been obvious to one having ordinary skill in the art at the time the invention was made to conduct the molding method according to the claimed flow rate, projected area, and pressure, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. One would have been motivated to adjust

the flow rate and pressure for the purposes of ensuring sufficient resin infusion in a timely manner while preventing damage to the preform.

43. Regarding claim 22, as stated above, Freitas teaches a pressure of 30psi which is about 0.2MPa.

44. Regarding claim 23, the method for molding the articles of Freitas uses a temperature of about 350F for 2hour to cure the articles. While this temperature and time are slightly higher than the claimed ranges, it is well known in the art to select an appropriate temperature and curing time based on the type of resin used as well as the dimensions of the article. It is well within the skill of a person having ordinary skill in the art to select the claimed curing time and temperature based on the type of resin used and size of the article.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT DYE whose telephone number is (571)270-7059. The examiner can normally be reached on Monday to Friday 8:00AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph S. Del Sole can be reached on (571)272-1130. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RCD

/Joseph S. Del Sole/

Supervisory Patent Examiner, Art Unit 1791